Chemistry

Focus: Chemical Science **Grades K-4**

Background:

Chemistry is the changes in the reactions between two different chemicals. The students will experience four demonstrations in which chemical reactions will take place through light energy, heat energy (exothermic & endothermic reactions) and stored energy.

Objectives:

- ✓ Students will discuss the importance of safety before using chemicals.
- ✓ Students will be able to identify the different kinds of energy.
- ✓ Students will be able to identify a physical change in energy.
- ✓ Students will be able to understand the difference between physical and chemical reactions.
- ✓ Students will be able to describe in their own words why reaction occurs.
- ✓ Students will be able to speculate which liquid would be best when making slime gelatin.

Learning outcomes:

Learning outcomes from this lesson parallel the 4th grade Ohio proficiency test.

- ✓ Select instruments, make observations and/or organize observations of an event, object or organism.
- ✓ Identify and/or compare the mass, dimensions and volume of familiar object in standard and/or non-standard units.
- ✓ Analyze a series of events and/or simple daily or seasonal cycles and predict the next likely occurrence in the sequence.
- ✓ Evaluate a simple procedure to carry out an exploration.
- ✓ Identify and/or discuss the selection of resources and tools used for exploring scientific phenomena.
- ✓ Demonstrate an understanding of safe use of materials and/or devices in science activities.
- ✓ Identify characteristics of a simple physical change.

Lesson #1: Overview

- ✓ Introduce yourself.
- ✓ Discuss safety first. What is energy?
- ✓ Discuss kinds of energy.
- ✓ Explain that energy is in nature.

Activity

Light Energy:

In this experiment we will use light sticks (they can be found in the automotive section of your local grocery , the camping section or the toy department). Three light sticks are placed in three glasses of water, one in hot , one in room temperature and one in cold. The objective is to observe the reaction that takes place in the different water temperatures. The sticks in the hot water have a shorter life because the heat causes the reaction inside to speed up and the light burns out faster. The opposite reaction takes place when the water is cold.

Exothermic Heat Energy:

This experiment mixed yeast with store bought hydrogen peroxide. The yeast acted as a catalyst to make the hydrogen peroxide break down into water and oxygen gas quickly. This breaking down releases energy causing the temperature increase. We made a slurry of yeast and a little bit of water first because it kept the yeast from staying in one big glob. When the yeast is spread out, it has a much easier time acting like a catalyst.

Endothermic Heat Energy:

Ever wonder why sore feet are supposed to be soaked in Epsom salts and water? Epsom salt (magnesium sulfate) takes energy from the environment to allow it to dissolve in the water. Thus, the water would be cooler than normal and the excess heat from a foot injury would transfer to the water reducing the swelling in that area. This process that place when ice is unavailable.

Stored Energy:

The polymer we made was essentially Elmer's glue with borax (laundry soap additive) as a cross linker. We used a pure chemical (polyvinyl alcohol) in the WOW experiment. Repeating the experiment with glue does create a polymer with a slightly different texture. Using Glue…Prep: 2 Tbsp borax per 2 cups water, stir to dissolve (add several drops Lysol Deodorizing Cleaner to solution to prevent mold growth if desired). Mix white glue with equal amount of water allowing about 2 Tbsp per student (i.e. 2 cups glue + 2 cups water = enough for 30 students). Solutions can be stored for several months, just shake it up a bit before use. Put 2 Tbsp per student glue mix plus a few drops of food coloring if desired and have students mix it with a stir stick (Popsicle style). Give each student 2 tsp borax solution. Have them stir it until a mass of goop forms. Have the students scrape the goop out of the cup and throw away the cup and any excess liquid. Tell them to knead the goop with their hands, bounce it, roll it into a snake etc. Ask if there are any practical uses for goop (who knows, you might get the next post-it note person). Store goop in Ziploc bags. Warn the students that Goop can grow mold after a few days if the students have dirty hands, so if they see mold growing it's time to throw it away. Other Goop use (if you have time): Using a water soluble felt tip marker write stuff (name) on a note card. Press the goop on the writing. It's like silly putty! Same with comic strips.

Chromatography: This technique is used in the lab to separate compounds all the time, although chemists don't use coffee filter paper very often, the filters work well for this experiment. Any marker or pen, can be used however the "color change" markers work best because there are at least two different dyes in the marker ink. The basic procedure involves drawing a small circle in the middle of the filter paper with a pencil. Draw over the circle with their marker of choice. Add drops of an acid (vinegar), base (baking soda solution) or plain water and see how it separates. Depending on the ink used, sometimes the acid will work better and sometimes the base will work better.

Fire Extinguisher: This demonstrates the removal of CO_2 (carbon dioxide) prevents a flame from continuing to burn. Place one longer candle and one shorter candle in the bottom of a large glass container. Spoon baking soda around the candles. Light the candles. Pour vinegar on the baking soda. Pour carefully this process create a foam so pour slowly. The reaction creates carbon dioxide, which is heavier than oxygen. The carbon dioxide fills the container from the bottom to the top, causing the shorter candle goes out faster than the taller candle.

Not Burning Dollar Bills: In this reaction a mix of 100 mL ethanol and 50 mL water was made and a dollar bill was soaked in it. Ethanol is chosen because it doesn't burn as hot as other alcohols such as isopropyl. Turn off the lights (the cooler flame means the flame is blue and hard to see in daylight). Holding the bill with tongs/tweezers, light the bill. The ethanol burns and the water evaporates leaving the bill unscathed. Emphasize DO NOT TRY THIS AT HOME.

Diaper Chemistry: The polymer that's typically in diapers is sodium polyacrylate. Of course, better diapers could mean a different polymer, but the idea is still the same. To get the polymer out, cut/rip apart the diaper in a bag (the polymer will scatter all over if you don't do it in a bag). Pull at the cotton parts of the diaper because a lot of polymer is stuck in that section. Once you get enough, start playing with it. Take a certain amount (1 tsp for example), put it in a bag and see how much water it will absorb (a lot more than you think). Add some to normal potting soil and do an experiment to see how often you have to water a plant in plain potting soil versus the soil with the polymer (salts in the soil allow the water to slowly be released by the polymer).